ENVIRONMENTAL ASSESSMENT FOR THE DISPOSITION OF STRONTIUM-90 RADIOISOTOPE THERMOELECTRIC GENERATORS

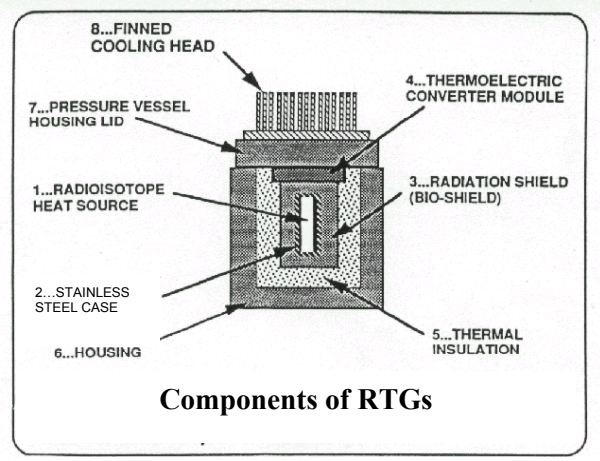
(DOE/EA-1351)

I INTRODUCTION

The U.S. Air Force (USAF) and U.S. Department of Energy (DOE) have joined to find a storage solution for ten (10) Strontium-90 Radioisotope Thermoelectric Generators (RTGs) scheduled to be removed from the Burnt Mountain Seismic Array Observatory in Alaska in summer 2002. In preparation for this activity, the USAF and DOE must develop an Environmental Assessment (EA) to comply with the requirements of the National Environmental Policy Act (NEPA) of 1969. This pamphlet describes RTGs, provides a brief history of RTGs at Burnt Mountain, and presents background information on the proposed action along with major events and decisions points regarding the Environmental Assessment.

II RADIOISOTOPE THERMOELECTRIC GENERATORS (RTGs)

RTGs use heat generated by decay of radioactive isotopes to produce electrical power. These are used as a power supply where frequent maintenance, refueling, or battery recharging or replacement is expensive or impossible, such as in the ocean, remote locations or outer space. RTGs have various designs, but all contain a radioactive heat source ("sealed source"), which generates heat from radioactive decay. RTGs also contain thermocouples that convert the heat into electricity; a radiation shield made of tungsten or depleted uranium; a stainless steel cooling radiator assembly surrounding the sealed source and thermocouple array; and a vessel to contain the device. Other components such as an insulation system or a power conditioner may also be present. The figure below shows typical components in an RTG unit.



Components of RTGs

The radioactive heat source used to power the RTGs addressed in the Environmental Assessment under consideration is strontium-90. For their size (strontium-90 RTGs range in height from 18 to 66 inches, in diameter from 14 to 52 inches, and weigh from 800 to almost 8,000 pounds), RTGs do not generate much energy. Typically, only about five percent of the heat from the strontium-90 is converted to electric power by the thermocouples. When the composite alloy metal in the thermocouple is heated, it creates a small current generating about 500 watts of electricity (enough to light about five 100-watt light bulbs) in the average RTG. However, as a power source they are reliable, virtually maintenance free, and capable of withstanding harsh environmental conditions.

RADIATION FROM RTGs

RTGs contain 4,000 to 500,000 curies of strontium-90 and the average is about 50,000 curies per unit. The radiation dose upon contact with any of nine of the Alaskan RTGs is about 50 millirems/hour, while that for the tenth unit is up to 125 millirems/hour. If a person were in contact with one of the smaller RTGs for ten minutes, the radiation dose would be about 8 millirems to the whole body, about the same as a chest x-ray. Normal atmospheric background radiation provides a dose of about 300 millirems/year, which is approximately the same as six hours in direct contact with an RTG. Because the RTGs will only be handled for short periods of time during transport and storage, remote handling equipment is not necessary for the RTGs.

All RTGs being considered for storage are extremely resistant to damage, and each RTG is its own Type B shipping container. This means commercial carriers in compliance with Department of Transportation regulations can transport RTGs without additional packaging.

RTGs have demonstrated a long and safe history of operation. Most of the strontium-90 RTGs currently in use or in storage were assembled for use in the 1960s and 1970s. Their use has continued to the present time, both for earth and space power applications. In their 40 years of use, there has never been a single radiation release, despite the very harsh environments in which RTGs have been used. Up to 50 of the 134 RTGs manufactured are under United States control. These include the 10 USAF RTGs at Burnt Mountain, 22 used by the Navy, 9 at DOE sites, and 6 in commercial use.

Strontium-90 RTGs are designated by the U.S. Nuclear Regulatory Commission's (NRC's) radionuclide classification system as Greater-than-Class-C low-level radioactive waste due to the type and amount of radioactivity. Greater-than Class-C waste is low-level radioactive waste that is not generally acceptable for disposal at depths less than 30 meters (about 100 feet) below ground. Disposal methods must, in general, be more stringent than those specified for other classes of low-level waste. Under the *Low-Level Radioactive Waste Policy Amendments Act of 1985* (Public Law 99-240), DOE is responsible for disposing of such waste in an NRC-licensed facility; however, no NRC-licensed disposal facility for Greater-than-Class-C waste currently exists. Therefore, DOE is committed to accepting RTGs as Greater-than-Class-C waste for storage prior to completion of a disposal facility.

III HISTORY OF THE 10 RTGS AT BURNT MOUNTAIN ALASKA

Sr-90 RTG at Burnt Mountain, Alaska

The 10 strontium-90 RTGs were used as remote power sources for instrumentation at the Burnt Mountain Seismic Observatory in Alaska. Tundra fires during the summer of 1992 damaged cables at the site, but caused

no damage to the RTGs. However, residents were alarmed to learn of the use of RTGs and speculated about the potential for nuclear contamination should the RTGs be damaged by fire or other mishap. Later that year, Alaska's Senators Frank Murkowski and Ted Stevens notified the USAF about local resident concerns over use of RTGs for unattended instrument power. This led to a decision in July 1995 to remove the RTGs. Even though the RTGs were considered the safest and best option for the remote power application, the USAF was tasked to identify and use other power sources so that the RTGs could be replaced.

In late 1996, DOE, Office of Environmental Management (DOE-EM) began discussions with the USAF on the fate of the RTGs. In 1998, DOE-EM committed to developing a program and the required NEPA documentation, to evaluate DOE acceptance of both the USAF and Navy RTGs through DOE's Off-Site Source Recovery Project. Shortly thereafter, the USAF expressed its intentions to pursue DOE interim storage of its RTGs and collaborate with DOE on the Environmental Assessment for RTG storage. At the same time, the USAF was running into technical difficulties with the replacement power sources for the RTGs. The targeted date for RTG removal was not met although the technical difficulties were resolved. On July 10, 2000, DOE-EM approved the preparation of the joint Environmental Assessment with the USAF and began to develop it. The proposed plan is now to remove the RTGs from Alaska in the summer of 2002.

IV THE PROPOSED ACTION

After determining that there was no need for the RTGs elsewhere in the USAF or the Department of Defense, the USAF made a decision to replace the 10 strontium-90 RTGs at the Burnt Mountain Seismic Array Observatory. This decision was based on the *Supplement to EA for Burnt Mountain Seismic Array Power Supply*, April 2000, 354 CES/CEVP, Eielson Air Force Base, Alaska.

MAJOR EA MILESTONES

March 2001 – Notification letter of the determination to prepare an EA regarding the disposition of RTGs. Notice provided to interested parties, potential transfer points (air force bases), and co-located DOE storage sites.

Winter 2001 - Draft EA issuance for at least a 30-day public comment period. Available at http://tis.eh.doe.gov/nepa/ (link to DOE NEPA Analysis, browse DOE Environmental Assessments), site-specific reading rooms, or by requesting a copy (see contact information at the end of the brochure).

Under authority specified in the *Low-Level Radioactive Waste Policy Amendments Act of 1985* (Public Law 99-240), DOE is conducting an ongoing program to accept excess and unwanted sealed sources, such as the RTGs, and store them in a safe and secure manner, pending development of a licensed disposal site for such sealed sources. The USAF has proposed that the RTGs be removed from Alaska and transferred to DOE for disposition under this program. In addition to the 10 RTGs from the USAF to be addressed in the EA, there are up to 40 additional RTGs from other sources that DOE might be asked to accept in the future. DOE is not aware at this time that organizations holding these additional RTGs have any specific plans to ask DOE to accept them. Nevertheless, to ensure that the Environmental Assessment addresses the maximum impacts that could result from DOE acceptance of RTGs, the document will analyze the potential acceptance of up to 50 RTGs.

RTG Storage Requirements

If the decision is made to move the RTGs, the selected DOE site could store the RTGs in an existing outside facility or storage pad. Minor modifications to the selected storage location may be needed. Because of their weight and radioactivity, RTGs should be stored to allow easy access by forklifts or cranes and allow access for surveillance and monitoring activities. Radiation releases from RTGs are highly unlikely. However, as with other low-level waste, the RTGs will require radiological controls, ventilation, and monitoring provisions. Worker access will be required to monitor the RTGs, but should be limited to ensure worker exposures are far below regulatory requirements. Both monitoring and leak detection should ensure rapid identification of potential releases.

The EA will evaluate several alternatives for disposition of the RTGs. As required under NEPA, the EA will evaluate a "No Action" alternative – in this case leaving the RTGs at the Burnt Mountain Seismic Array Observatory. The EA will also address: (1) transfer of the RTGs to DOE for storage pending reuse or recycling, and (2) transfer of the RTGs to DOE for storage pending disposal. For both these alternatives, the USAF would first transport the RTGs from their current locations in the Burnt Mountain Seismic Array Observatory to the airfield at Eielson Air Force Base, Alaska. USAF aircraft would then transport the RTGs from Alaska to a USAF base located near a DOE storage site. Finally, the RTGs would be transported by truck to the DOE site for storage pending either reuse/recycling or disposal.

The nine potential DOE storage sites that will be addressed were selected from 54 DOE sites on the following basis: (1) their current involvement in management of low level radioactive waste; (2) the expectation that they will remain open through 2015, and (3) management presence by either the DOE Environmental Management program office or the DOE Albuquerque Operations Office to ensure effective institutional control and management. These sites are:

- Hanford Site, Richland, WA
- Idaho National Engineering and Environmental Laboratory, Idaho Falls, ID
- Kansas City Plant, Kansas City, MO
- Los Alamos National Laboratory, Los Alamos, NM
- Nevada Test Site, Las Vegas, NV
- Oak Ridge Reservation, Oak Ridge, TN
- Pantex Plant, Amarillo, TX
- Sandia National Laboratories, Albuquerque, NM
- Savannah River Site, Aiken, SC

The EA will evaluate if the proposed action will have a significant impact upon the environment. If not, a finding of no significant impact will be issued for public review and comment before the final determination is made. Otherwise, the proposed action and various alternatives will be analyzed in an environmental impact statement.

If the decision is made to move the RTGs, the selected DOE site will not necessarily become the *de facto* disposal site. Selection of a disposal site will be addressed in another NEPA process.

Additional Information

For more information, visit our website at http://osrp.lanl.gov and go to "useful links." Comments and requests for further information should be addressed to Mr. Robert A. Campbell, EM-22, Office of Technical Program Integration, U.S. DOE, e-mail: ROBERT.CAMPBELL@em.doe.gov; telephone: 678-567-0336 or to Mr. Steve Noe, USAF (AFTAC Public Affairs) at (321) 494-2837 or aftacxpm@patrick.af.mil. If you would like to receive a postcard notifying you of the availability of the draft EA, contact Mr. Campbell at the location above.